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(54) **INTERNAL HEAT EXCHANGER INTEGRATED WITH GAS COOLER**

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F25B 41/00 (2006.01)

(52) **U.S. Cl.** **62/513**; 62/113; 165/140; 165/175; 236/34

(58) **Field of Classification Search** 62/513, 62/113; 236/34; 165/175, 140
See application file for complete search history.

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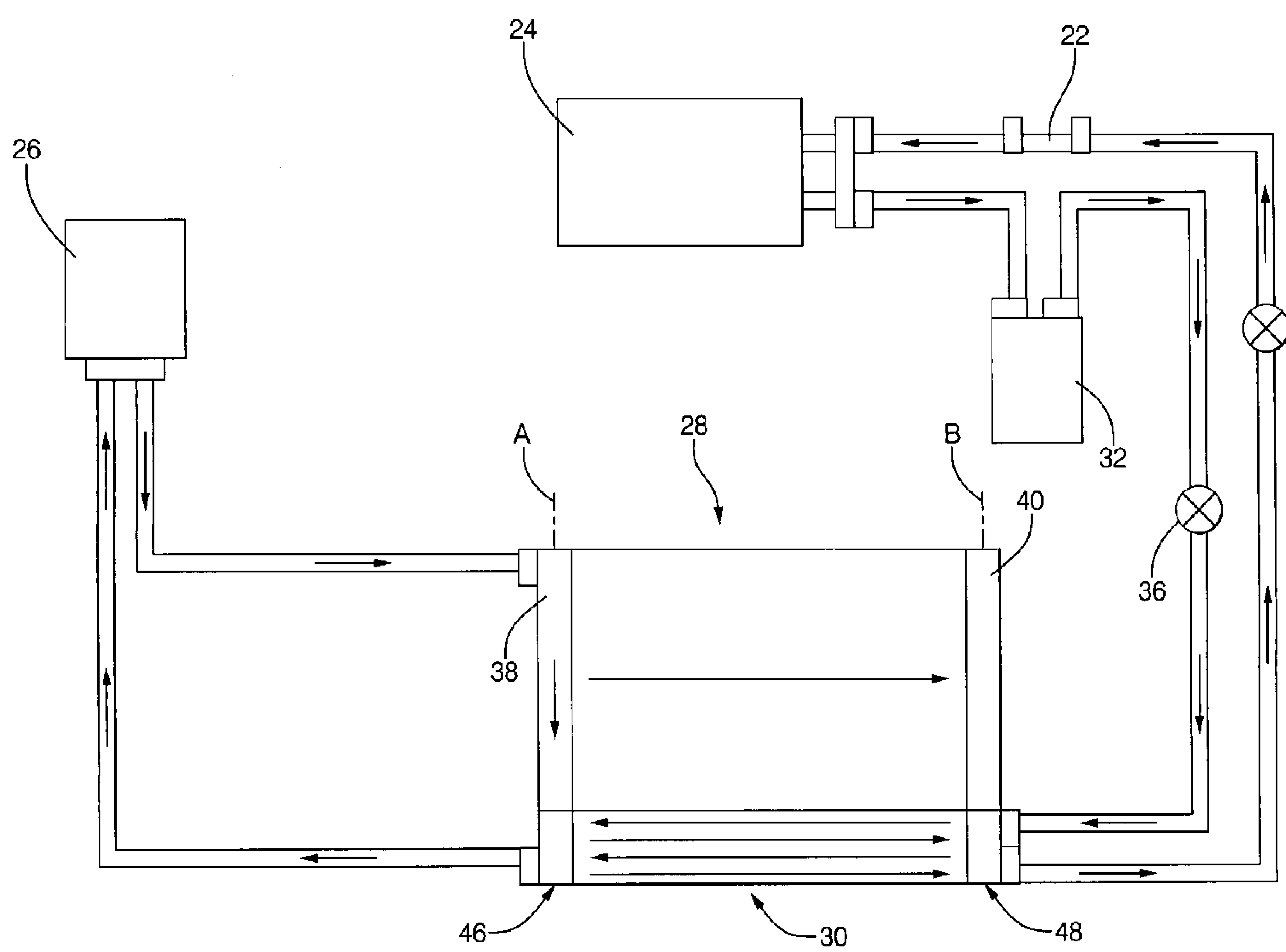
(57) **ABSTRACT**

A gas cooler and heat exchanger assembly comprises a gas cooler, including a cylindrical inlet header and a cylindrical outlet header, and a heat exchanger, including a first tank and a second tank, with at least a portion of each of the tanks being cylindrical and being an extension of and integral with each of the associated and aligned headers. In the first embodiment, the entirety of each of the tanks is cylindrical in shape and extends from the associated header. Each of the tanks is bisected thus defining a semi-cylindrical hot chamber and a semi-cylindrical cool chamber. In the second embodiment, only the cylindrical hot chamber of each of the tanks is cylindrical in shape and extends from the associated header. An additional box-shaped structure defines a box-shaped cool chamber disposed along and inwardly of each of the cylindrical hot chambers.

12 Claims, 3 Drawing Sheets



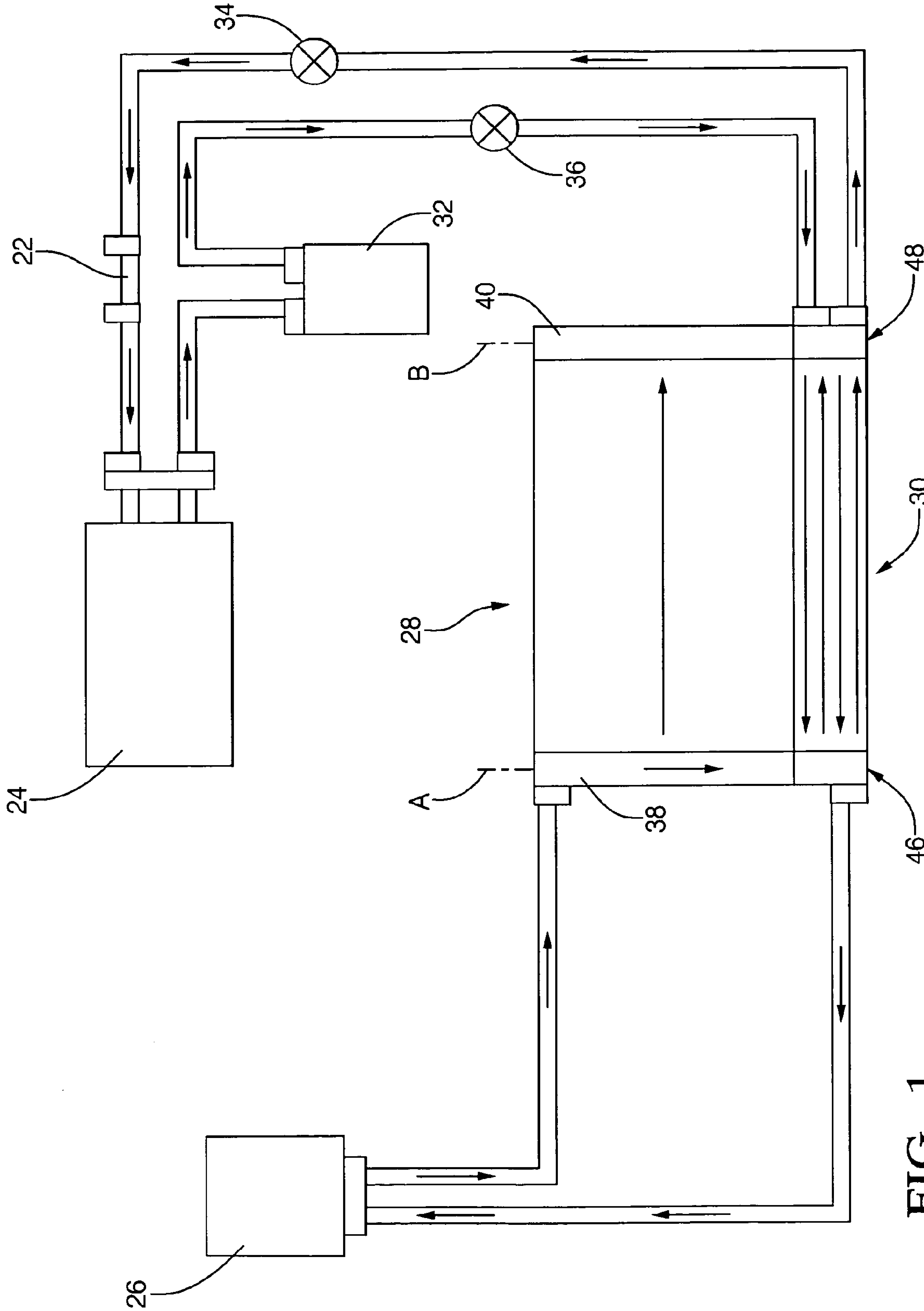


FIG. 1

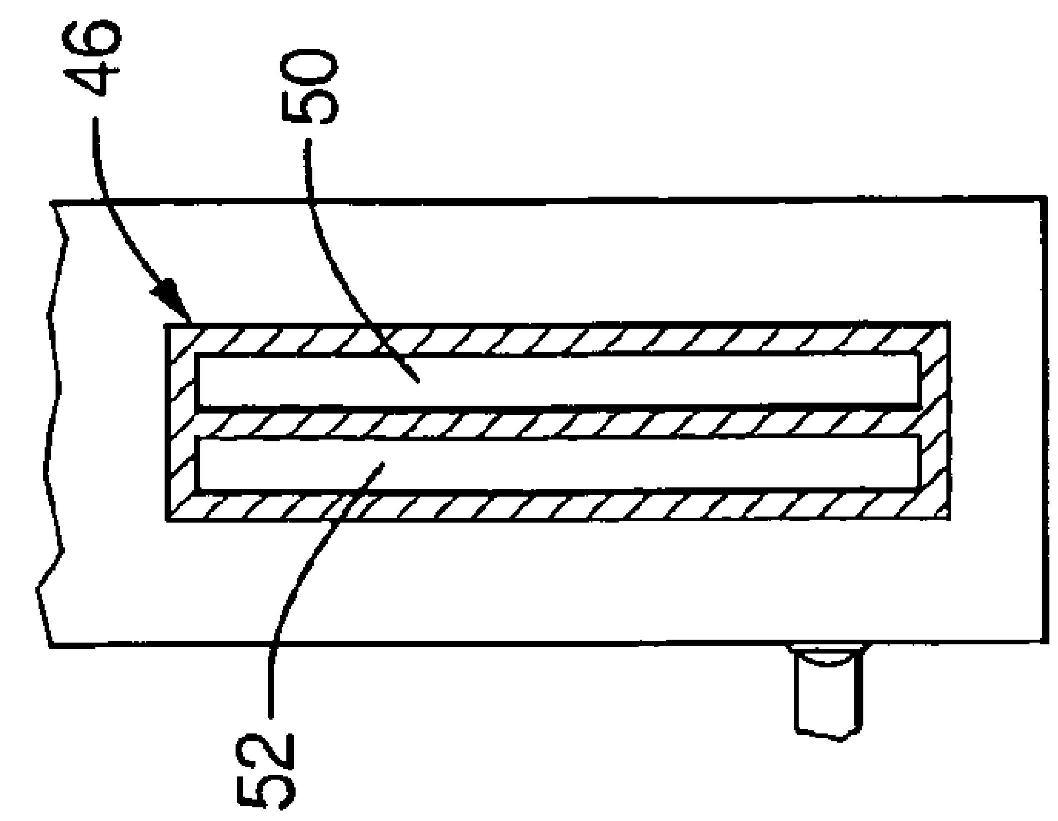


FIG. 4

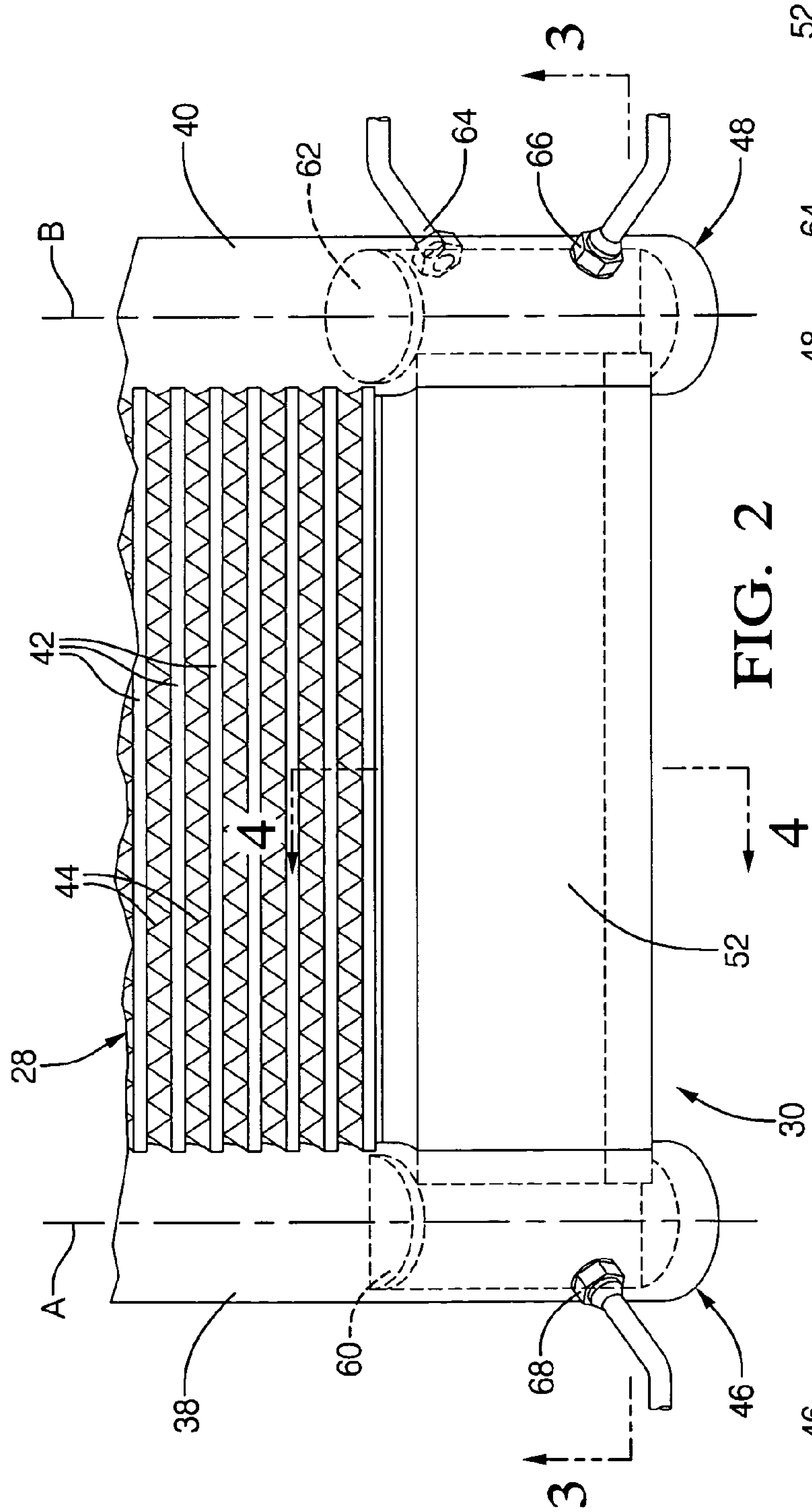


FIG. 2

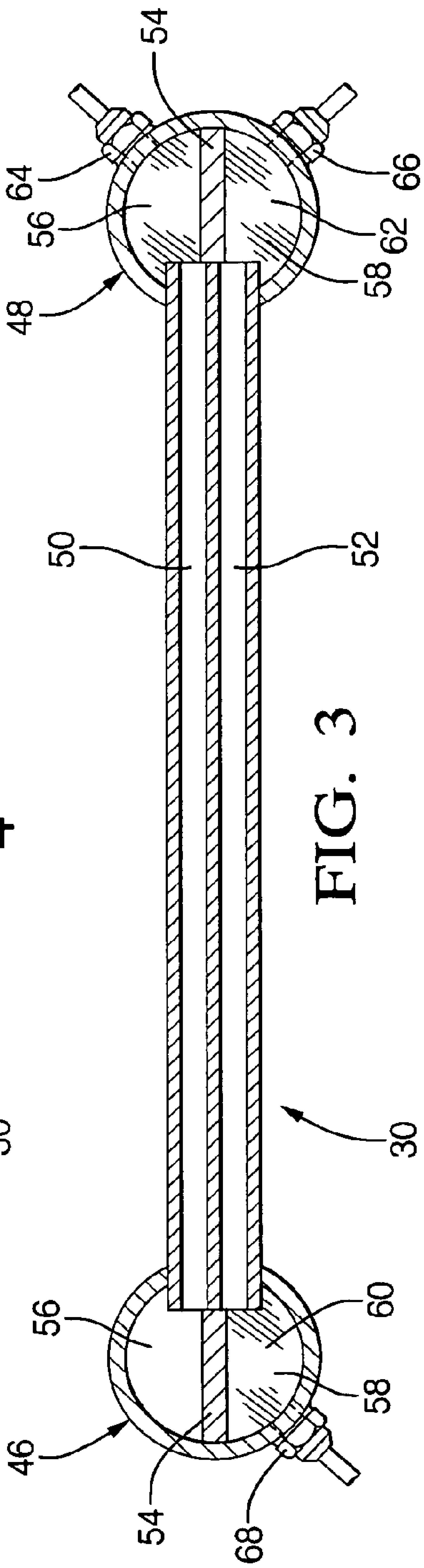


FIG. 3

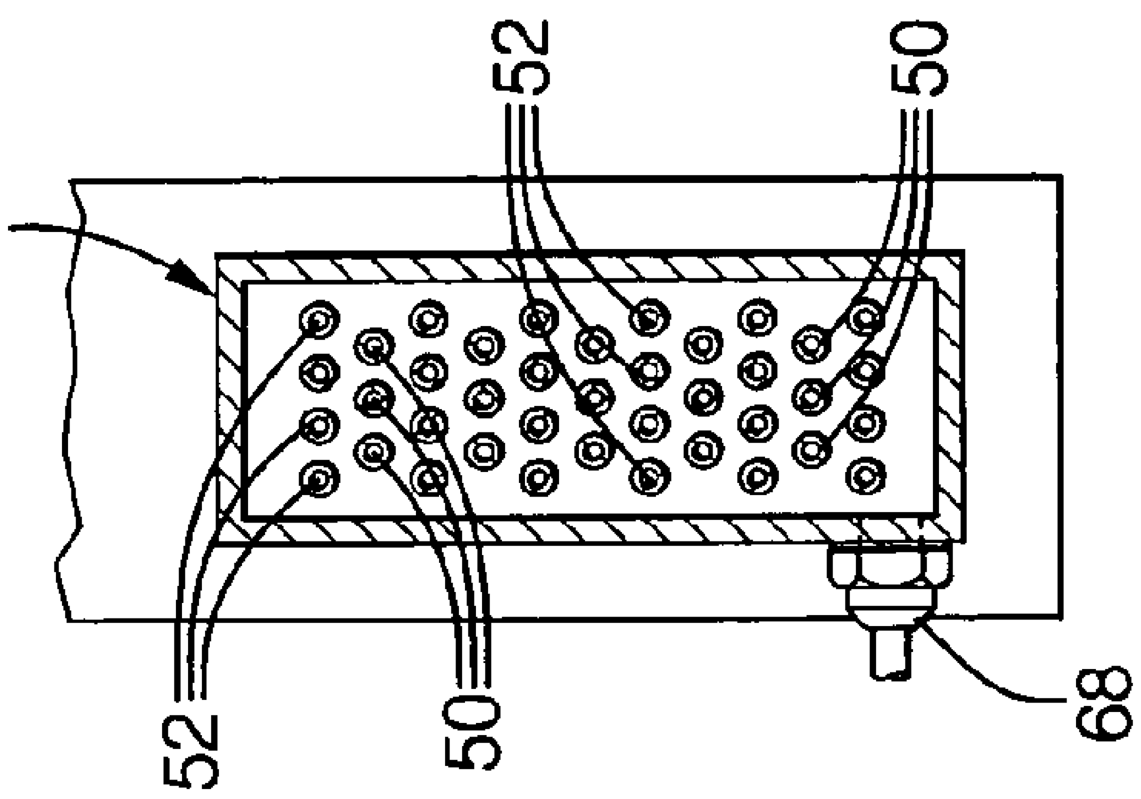


FIG. 7

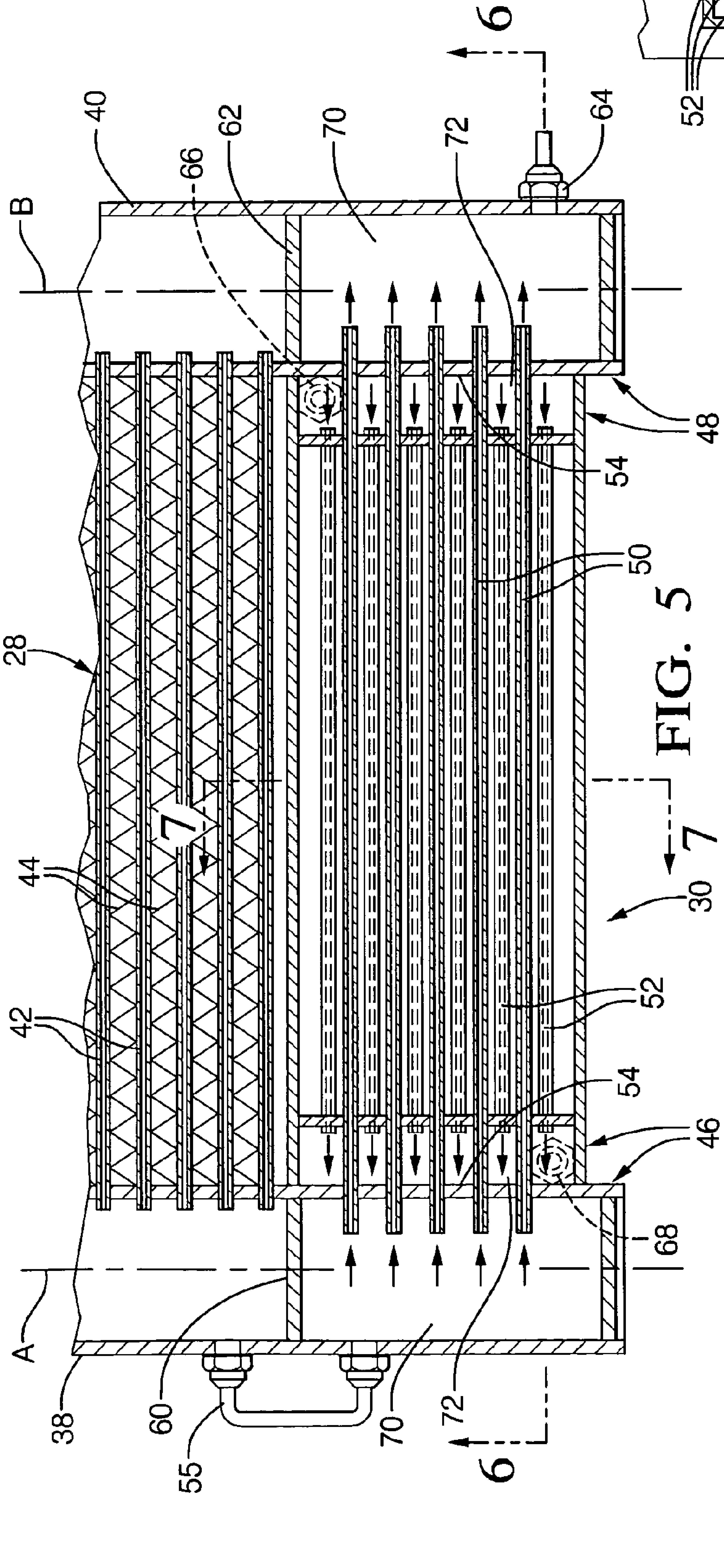


FIG. 5

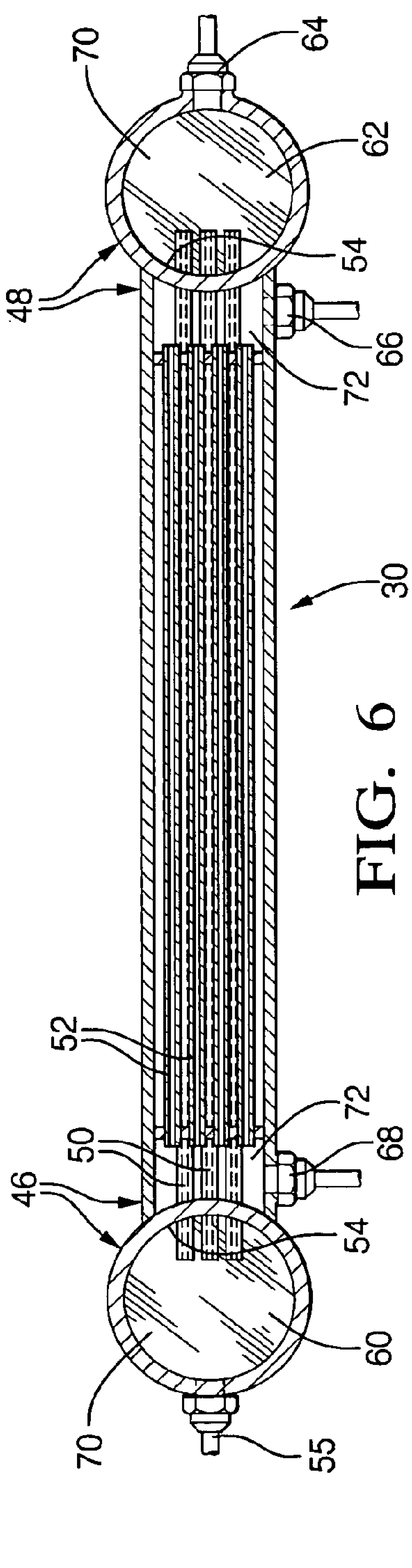


FIG. 6

INTERNAL HEAT EXCHANGER INTEGRATED WITH GAS COOLER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an air conditioning assembly for cooling.

2. Description of the Prior Art

Most automotive air conditioning assemblies comprise a compressor, a gas cooler, an expansion device, and an evaporator. Conventional refrigerants include R **134***a* and R **744** (Carbon Dioxide). The air conditioning assemblies that utilize R **134***a* as the refrigerant typically operate such that the critical pressure of the refrigerant is not exceeded. Heat supply and heat removal take place via evaporation and condensation of the refrigerant and there is no need for an internal heat exchanger.

However, in the air conditioning assemblies that utilize R **744** as the refrigerant, the pressure of the refrigerant in the system may become higher than the critical pressure of the refrigerant. Under this condition, the fluid exiting the gas cooler remains a high pressure, high temperature vapor. Also, the vapor exiting the evaporator contains a fraction of low pressure, low temperature residual liquid. The cooling of the high temperature, high pressure gas with the low temperature fluid exiting the evaporator improves the efficiency level of the assembly. To obtain an efficiency level equal to or better than an assembly utilizing R **134***a* as a refrigerant, it is necessary to use a heat exchanger in fluid communication with the gas cooler, the expansion device and the evaporator.

Typically, the gas cooler is located in the front of the vehicle and the compressor is located away from the gas cooler and closer to the evaporator. These physical restrictions make it impractical to use a heat exchanger without compromising the overall performance of the air conditioning assembly. As such, when there is a need for an internal heat exchanger, the internal heat exchanger is often manufactured and installed separately. Such an internal heat exchanger may be a suction line heat exchanger, which cools the fluid leaving the condenser (in a traditional refrigerant system) or the gas cooler (in an R **744** system). In an R **744** system, when an accumulator/dehydrator is placed at the front of the vehicle for packaging purposes, a suction line has to be routed to the front of the vehicle. In such cases, the most beneficial location of the internal heat exchanger is near the gas cooler at the front of the vehicle. The combination of the separate installation of the heat exchanger and the positioning of the heat exchanger at the front of the vehicle results in increased assembly costs and additional connection equipment.

The U.S. Pat. No. 5,544,498 to Benedict discloses an air conditioning assembly including a compressor, a gas cooler, an expansion device, an evaporator, and a heat exchanger. The heat exchanger is used to remove residual vapor from liquid refrigerant and residual liquid from vapor refrigerant as the refrigerant circulates through the system. The U.S. Pat. No. 6,189,334 to Dienhart, et al. provides for a similar air conditioning assembly with the heat exchanger and the gas cooler in one constructional unit.

Although the prior art connects a heat exchanger to a gas cooler in an air conditioning system, the heat exchanger and the gas cooler are separately constructed and fabricated, i.e., the heat exchanger is essentially a separate component to the gas cooler.

SUMMARY OF THE INVENTION AND ADVANTAGES

The subject invention provides a gas cooler and heat exchanger assembly for condensing a refrigerant comprising a gas cooler including an inlet header extending along a first axis, an outlet header extending along a second axis parallel to and spaced from the first axis, and a plurality of condensing tubes extending between the headers for conveying refrigerant therebetween. A heat exchanger includes a first tank extending along the first axis from the inlet header and a second tank extending along the second axis from the outlet header. At least one hot tube extends between the tanks to define a hot passage and at least one cool tube extends between the tanks to define a cool passage.

The proposed invention provides a combined and unitary gas cooler and heat exchanger assembly wherein the heat exchanger is integrated with the gas cooler. The design is such that the gas cooler and the heat exchanger share elements or components and can be brazed together to yield a single or unitary assembly for use in an air conditioning system. As a result, component and fabrication costs are reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. **1** is a schematic drawing of an air conditioning system showing flow of refrigerant;

FIG. **2** is a fragmented front perspective view of a first embodiment of the invention;

FIG. **3** is a cross sectional view taken along the line **3-3** of FIG. **2**;

FIG. **4** is a cross sectional view taken along the line **4-4** of FIG. **2**;

FIG. **5** is a fragmented front perspective view of a second embodiment of the invention;

FIG. **6** is a cross sectional view taken along the line **6-6** of FIG. **5**; and

FIG. **7** is a cross sectional view taken along the line **7-7** of FIG. **5**.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the Figures, wherein like numerals indicate corresponding parts throughout the several views, an air conditioning assembly for cooling is generally shown in FIG. **1**. The air conditioning assembly comprises an expansion device **22**, an evaporator **24**, a compressor **26**, a gas cooler **28**, and a heat exchanger **30** generally shown. The air conditioning assembly also includes an accumulator-dehydrator **32**, a charge valve **34**, and a service valve **36**, all being well known in the art.

The expansion device **22** expands a refrigerant that is circulated through the assembly. The expansion device **22** is in fluid communication with and between the heat exchanger **30** and the evaporator **24**. The expansion device **22** receives refrigerant from the heat exchanger **30**, expands the refrigerant, and discharges the refrigerant to the evaporator **24**. In other words, the expander de-pressurizes the incoming refrigerant and yields a lower temperature, lower pressure outgoing refrigerant.

The evaporator **24** receives the low-pressure liquid/gaseous refrigerant from the expansion device **22** and adds heat from an outside source to the refrigerant. This addition of heat causes the refrigerant to undergo a phase change from mostly liquid to all vapor. The refrigerant exiting the evaporator **24** is in the vapor state, but an amount of residual liquid remains in the evaporated refrigerant. The resultant vapor and liquid refrigerant is discharged from the evaporator **24** to the heat exchanger **30**.

The compressor **26** is in fluid communication with the heat exchanger **30** and with the gas cooler **28** so as to be positioned therebetween. More specifically, the compressor **26** receives refrigerant from the heat exchanger **30**, pressurizes the refrigerant, and discharges the refrigerant to the gas cooler **28**. The pressure of the refrigerant exiting the compressor **26** is higher than that of the refrigerant entering the compressor **26**.

Accordingly, refrigerant is pressurized by the compressor **26** and flows to the gas cooler **28**. From the gas cooler **28**, the refrigerant flows through the heat exchanger **30** in one direction to the evaporator **24**, from which the refrigerant flows back through the heat exchanger **30** in the opposite direction, and then back to the compressor **26**.

The gas cooler **28** includes a cylindrical inlet header **38** that extends along a vertical first axis A, and a cylindrical outlet header **40** that extends along a second axis B parallel to and spaced from the first axis A. A plurality of condensing tubes **42** extends between the headers **38**, **40** for conveying refrigerant therebetween. A plurality of corrugated fins **44** is disposed between the condensing tubes **42**. The inlet header **38** receives the pressurized vapor refrigerant from the compressor **26** and directs it to the condensing tubes **42**. The fins **44** contact the condensing tubes **42** conveying the vapor refrigerant so that the fins **44** extract heat from the condensing tubes **42** and the refrigerant therein. The fins **44** transfer the heat into a stream of cooling air flowing over the fins **44** between adjacent condensing tubes **42**. When the refrigerant temperature is below the critical temperature, the removal of heat causes the refrigerant to undergo a phase change from vapor to liquid, whereby the refrigerant exiting the gas cooler **28** is in the liquid state. However, when the refrigerant temperature exceeds the critical temperature, the removal of heat cases the high temperature vapor to exit at a lower temperature but still in the vapor phase.

The heat exchanger **30** is in fluid communication with and receives the refrigerant from the evaporator **24**, which refrigerant flows through the heat exchanger **30** to the compressor **26**. The heat exchanger **30** includes a first tank **46**, generally indicated, that extends along the first axis A and downwardly from the inlet header **38** and a second tank **48**, generally indicated, that extends along the second axis B and downwardly from the outlet header **40**. At least one hot tube **50** extends between the tanks **46**, **48** and at least one cool tube **52** extends between the tanks **46**, **48**. Each hot tube **50** defines a hot passage and each cool tube **52** defines a cool passage.

As alluded to above, a cylinder defines each of the headers **38**, **40** and each cylinder defines an axially aligned and associated portion of one of said tanks **46**, **48**. In other words, a portion of each of the tanks **46**, **48** is an extension of the cylinder aligned with and extending along the same axis as the associated one of the cylindrical headers **38**, **40**. The first tank **46** and the inlet header **38** both extend along the first axis A and a portion of the first tank **46** is an extension of the axially aligned inlet header **38**. Similarly, the second tank **48** and the outlet header **40** extend along the second axis B and a portion of the second tank **48** is an extension of the axially aligned outlet header **40**.

Referring to the first embodiment of FIGS. **2**, **3**, and **4**, each of the tanks **46**, **48** is cylindrical and an extension of and integral with the associated one of the aligned headers **38**, **40**. A partition **54** divides each of the cylindrical tanks **46**, **48** into a semi-cylindrical hot chamber **56** and a semi-cylindrical cool chamber **58**. The partition **54** in each of the cylindrical tanks **46**, **48** extends diametrically on the diameter of the cylindrical tanks **46**, **48**. In other words, the partition **54** in each of the tanks **46**, **48** bisects the circular cross section of each of the tanks **46**, **48**. The partition **54** in the first tank **46** extends downwardly along the first axis A and splits the cylindrical first tank **46** into the semi-cylindrical hot chamber **56** and the semi-cylindrical cool chamber **58**, both disposed in the cylindrical first tank **46**. Similarly, the partition **54** in the second tank **48** extends downwardly along the second axis B and splits the cylindrical second tank **48** into the semi-cylindrical hot chamber **56** and the semi-cylindrical cool chamber **58**, both disposed the cylindrical second tank **48**.

Continuing with the first embodiment, a semi-circular inlet separator **60** is disposed between the cylindrical inlet header **38** and the cylindrical first tank **46** to separate the interior of the inlet header **38** from the semi-cylindrical cool chamber **58** of the first tank **46** but not from the semi-cylindrical hot chamber **56** of the first tank **46**, which is left open on top to receive refrigerant from the inlet header **38**. The inlet separator **60** joins the partition **54** at the top of the first tank **46** to further define and close the semi-cylindrical cool chamber **58** so that there is no fluid communication between the inlet header **38** and the semi-cylindrical cool chamber **58**. The remaining semi-cylindrical space in the first tank **46** becomes the semi-cylindrical hot chamber **56**, which is a mirror image of the semi-cylindrical cool chamber **58** except that it is not closed on the top.

On the other end, a circular outlet separator **62** is disposed between the cylindrical outlet header **40** and the cylindrical second tank **48** to separate the entire circular interior of the outlet header **40** from both semi-cylindrical chambers **56**, **58** of the second tank **48**. The outlet separator **62** joins the partition **54** at the top of the second tank **48** to further define and close both the semi-cylindrical hot chamber **56** and the semi-cylindrical cool chamber **58** so that there is no fluid communication between the outlet header **40** and the semi-cylindrical chambers **56**, **58**.

In the first embodiment, a single hot tube **50** and a single cool tube **52** are disposed in a parallel and side-by-side relationship with one another. Both the hot tube **50** and the cool tube **52** have a rectangular cross section. The rectangular cross section extends longitudinally and axially along the tanks **46**, **48**. In other words, the tubes **50**, **52** are box-shaped with the vertical heights being greater than the horizontal widths. The hot tube **50** extends between semi-cylindrical hot chambers **56**, which are defined by each of the tanks **46**, **48** and the cool tube **52** extends between semi-cylindrical cool chambers **58**, which are defined by each of the tanks **46**, **48**. The semi-cylindrical hot chamber **56** of the first tank **46** receives refrigerant from the gas cooler **28** and directs the refrigerant into the hot tube **50**, which directs the refrigerant to the semi-cylindrical hot chamber **56** of the second tank **48**. The semi-cylindrical hot chamber **56** of the second tank **48** receives the refrigerant from the hot tube **50** and directs the refrigerant to the expansion device **22**, via a hot outlet **64**, from the semi-cylindrical hot chamber **56** of the second tank **48**.

The semi-cylindrical cool chamber **58** of the second tank **48** of the heat exchanger **30** is in fluid communication with the evaporator **24** via a suction inlet **66** to receive refrigerant from the evaporator **24** and direct the refrigerant into the cool tube **52**. The cool tube **52** directs the refrigerant received from the evaporator **24** from the semi-cylindrical cool chamber **58** of the second tank **48** to the semi-cylindrical cool chamber **58** of the first tank **46**. The semi-cylindrical cool chamber **58** of the first tank **46** directs refrigerant from the cool tube **52** to the compressor **26** via a suction outlet **68**.

As the refrigerant flows through the tubes **50**, **52**, heat is transferred between the hot and cool tubes **50**, **52**. The residual vapor in the refrigerant from the gas cooler **28** is cooled and undergoes a phase change from vapor to liquid. The residual liquid in the refrigerant from the evaporator **24** is heated and undergoes a phase change from liquid to vapor.

The suction inlet **66** extends into the semi-cylindrical cool chamber **58** of the second tank **48** and receives refrigerant from the evaporator **24**. The suction outlet **68** extends out of the semi-cylindrical cool chamber **58** of the first tank **46** and discharges refrigerant from the semi-cylindrical cool chamber **58** of the first tank **46** to the compressor **26**. The refrigerant flows from the suction inlet **66** to the semi-cylindrical cool chamber **58** of the second tank **48** through the cool tube **52** to the semi-cylindrical cool chamber **58** of the first tank **46** and out the suction outlet **68**.

The opening in the top of the hot chamber of the first tank **46** serves as an inlet for refrigerant from the inlet header **38** of the gas cooler **28**. The hot outlet **64** extends out of the semi-cylindrical hot chamber **56** of the second tank **48** and discharges refrigerant from the semi-cylindrical hot chamber **56** of the second tank **48** to the expansion device **22**. The refrigerant flows from the semi-cylindrical hot chamber **56** of the first tank **46** through the hot tube **50** to the semi-cylindrical hot chamber **56** of the second tank **48** and out the hot outlet **64**.

In the second embodiment shown in FIGS. **5**, **6**, and **7**, only a cylindrical hot chamber **70** portion of each of the tanks **46**, **48** is cylindrical and an extension of and integral with the respective one of the associated and aligned headers **38**, **40**. A section of the side wall of the cylinder defines a partition **54** extending the length of each of the tanks **46**, **48** and divides each of the tanks **46**, **48** into the cylindrical hot chamber **70** and a box-shaped cool chamber **72**. In other words, the axially aligned and associated cylindrical hot chamber **70** portions of the tanks **46**, **48** extend from and are defined by the cylinders of the respective cylindrical headers **38**, **40**. These extending portions define each cylindrical hot chamber **70** as being circular in cross section. In other words, the cylindrical hot chambers **70** form a cylindrical shape as they extend downwardly from the respective headers **38**, **40** and along the respective axes A, B. A box-shaped cool chamber **72** defines the remaining portion of each of the tanks **46**, **48** and is rectangular in cross section. In other words, each of the box-shaped cool chambers **72** forms a box-like shape and extends downwardly along and inwardly of the respective cylindrical hot chamber **70** whereby that section of each cylinder covered by a box-shaped cool chamber **72** defines the partition **54** in each of the tanks **46**, **48** to separate the cylindrical hot chamber **70** from the box-shaped cool chamber **72**.

A circular inlet separator **60** is disposed between the inlet header **38** and the first tank **46** to separate the entire interior of the inlet header **38** from the cylindrical hot chamber **70** of the first tank **46**. The inlet separator **60** joins the partition **54** at the top of the first tank **46** to further define and close the cylindrical hot chamber **70**. A hot inlet **55** is defined by the circular inlet separator **60**. The hot inlet **55** is an aperture that conveys refrigerant from the inlet header **38** into the cylindrical hot chamber **70** of the first tank **46**. Alternatively, the hot inlet **55** can be eliminated and an internal passage can be created in the circular inlet separator **60**.

Similarly, a circular outlet separator **62** is disposed between the outlet header **40** and the second tank **48** to separate the entire interior of the outlet header **40** from the cylindrical hot chamber **70** of the second tank **48**. The outlet separator **62** joins the partition **54** at the top of the second tank **48** to further define and close the cylindrical hot chamber **70** so that there is no fluid communication between the outlet header **40** and the cylindrical hot chamber **70** of the second tank **48**.

A plurality of hot tubes **50** and a plurality of cool tubes **52** are disposed in a parallel and side-by-side relationship with one another. Each of the hot tubes **50** and each of the cool tubes **52** define a circular cross section. Each hot tube **50** extends between the cylindrical hot chambers **70**, and each cool tube **52** extends between box-shaped cool chambers **72**. The suction inlet **66** extends into the box-shaped cool chamber **72** of the second tank **48** and receives refrigerant from the evaporator **24**. The suction outlet **68** extends out of the box-shaped cool chamber **72** of the first tank **46** and discharges refrigerant from the box-shaped cool chamber **72** of the first tank **46** to the compressor **26**. The refrigerant flows from the suction inlet **66** to the box-shaped cool chamber **72** of the second tank **48** through the cool tubes **52** to the box-shaped cool chamber **72** of the first tank **46** and out the suction outlet **68**.

The hot inlet **55** leads into the cylindrical hot chamber **70** of the first tank **46** and conveys refrigerant from inlet header **38** of the gas cooler **28**. The hot outlet **64** extends out of the cylindrical hot chamber **70** of the second tank **48** and discharges refrigerant from the cylindrical hot chamber **70** of the second tank **48** to the expansion device **22**. The refrigerant flows from the hot inlet **55** to the cylindrical hot chamber **70** of the first tank **46** through the hot tubes **50** to the cylindrical hot chamber **70** of the second tank **48** and out the hot outlet **64**.

Although the embodiments of the invention vary slightly in structure, they include the same combination of elements. Both embodiments of the invention have at least one hot tube **50** and at least one cool tube **52** extending between the tanks **46**, **48**. The first embodiment has only one hot tube **50**, while the second embodiment has a plurality of hot tubes **50**. Similarly, the first embodiment has only one cool tube **52**, while the second embodiment has a plurality of cool tubes **52**. The tubes **50**, **52** if either embodiment may be of any cross sectional shape and may vary in number.

A portion of each of the tanks **46**, **48** is an extension of the respective axially aligned header in both embodiments. In the first embodiment, the entirety of each of the tanks **46**, **48** is a cylindrical extension of the respective header, while in the second embodiment, only the cylindrical hot chamber **70** portion of each of the tanks **46**, **48** is an extension of the respective header.

Both embodiments include a partition **54** dividing the tanks **46**, **48** into a hot chamber and a cool chamber. In the first embodiment, the partition **54** splits each tank into a semi-cylindrical hot chamber **56** and a semi-cylindrical cool chamber **58**, each a mirror image of the other. However, the partition **54** of the second embodiment divides each tank into a cylindrical hot chamber **70** and a box-shaped cool chamber **72**.

Both embodiments include an inlet separator **60** in the first tank **46** for separating the interior of the inlet header **38** from at least one of the hot chamber and the cool chamber. In the first embodiment, only the semi-cylindrical cool chamber **58** is separated from the interior of the inlet header **38**. The semi-cylindrical hot chamber **56** is left open to serve as an inlet for refrigerant. The inlet separator **60** of the second embodiment separates the entire inlet header **38** from the cylindrical hot chamber **70**.

Both embodiments include an outlet separator **62** in the second tank **48** for separating the interior of the outlet header **40** from at least one of the hot chamber and the cool chamber. In the first embodiment, both the semi-cylindrical cool chamber **58** and the semi-cylindrical hot chamber **56** are separated from the interior of the outlet header **40**. The outlet separator **62** of the second embodiment separates the outlet header **40** from only the cylindrical hot chamber **70**.

The alignment of the tanks **46**, **48** with their respective headers **38**, **40** allows the tanks **46**, **48** to be integral with their respective headers **38**, **40** thereby greatly simplifying the manufacturing and fabrication processes. In other words, the headers **38**, **40** and tanks **46**, **48** can be pre-fabricated with the condensing tubes **42** and the hot tubes **50** and the cool tubes **52** and placed in a brazing oven to be brazed together. The need for additional connections and componentry is significantly reduced.

While the invention has been described with reference to an exemplary embodiment, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the invention. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from the essential scope thereof. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. An air conditioning assembly for cooling comprising;

a compressor for compressing refrigerant,

a gas cooler for cooling and condensing refrigerant from said compressor,

an expansion device for expanding refrigerant,

an evaporator for evaporating the refrigerant from said expansion device,

a heat exchanger having a hot passage for the flow of refrigerant therethrough from said gas cooler to said expansion device and a cool passage for the flow of refrigerant therethrough from said evaporator to said compressor for exchanging heat between said passages,

said gas cooler including an inlet header being circular in cross section and extending along a first axis and in fluid communication with said compressor and an outlet header being circular in cross section and extending along a second axis parallel to and spaced from said first axis and a plurality of condensing tubes extending between said headers for conveying refrigerant therebetween,

said heat exchanger including a first tank being circular in cross section and extending along said first axis from said inlet header and a second tank being circular in cross section and extending along said second axis from said outlet header and at least one hot tube extending between said tanks to define said hot passage and at least one cool tube extending between said tanks to define said cool passage,

at least a portion of each of said tanks being an extension of said respective axially aligned header,

at least a portion of each of said tanks being integral with said respective axially aligned header,

a partition dividing each of said tanks into a hot chamber and a cool chamber,

an inlet separator for separating the interior of said inlet header from at least one of said hot chamber and said cool chamber of said first tank,

an outlet separtor for separating the interior of said outlet header from at least one of said hot chamber and said cool chamber of said second tank,

said hot tube extending between said hot chamber of said first tank and said hot chamber of said second tank and said cool tube extending between said cool chamber of said first tank and said cool chamber of said second tank, and

a homogenous cylinder defining each of said headers and at least an axially aligned and associated portion of one of said tanks.

2. An assembly as set forth in claim **1** including said partition in each of said tanks extending diametrically on the diameter of said cylindrical tank to define a semi-cylindrical hot chamber and a semi-cylindrical cool chamber being semicircular in cross section.

3. An assembly as set forth in claim **2** wherein said inlet separator joins said partition in said first tank and extends to a rounded periphery to close said semi-cylindrical cool chamber therein and to separate said semi-cylindrical cool chamber of said first tank from the interior of said inlet header.

4. An assembly as set forth in claim **3** wherein said outlet separator joins said partition in said second tank and extends to a rounded periphery to close said semi-cylindrical hot chamber and said semi-cylindrical cool chamber therein to separate said semi-cylindrical chambers of said second tank from the interior of said outlet header.

5. An assembly as set forth in claim **4** wherein said hot tube and said cool tube are disposed in parallel and side-by-side relationship with one another.

6. An assembly as set forth in claim **5** wherein said hot tube and said cool tube each define a rectangular cross section extending longitudinally and axially along said tanks.

7. An assembly as set forth in claim **6** including a suction outlet in said first tank leading from said semi-cylindrical cool chamber for discharging refrigerant from said semi cylindrical cool chamber to said compressor, a suction inlet in said second tank leading into said semi-cylindrical cool chamber for receiving refrigerant from said evaporator, and a hot outlet in said second tank leading from said semi-cylindrical hot chamber for discharging refrigerant from said semi-cylindrical hot chamber to said expansion device.

8. An assembly as set forth in claim **1** including said portion of each of said tanks being defined by said extension of said cylinder and defining a cylindrical hot chamber as being circular in cross section, and each of said tanks defining a box-shaped cool chamber being rectangular in cross section and extending along and inward of said cylindrical hot chamber with said partition disposed therebetween.

9. An assembly as set forth in claim **8** including said inlet separator being circular and disposed in said cylinder between said cylindrical hot chamber of said first tank and the interior of said cylindrical inlet header.

10. An assembly as set forth in claim **9** including said outlet separator being circular and disposed in said cylinder between said cylindrical hot chamber of said second tank and the interior of said cylindrical outlet header.

11. An assembly as set forth in claim **10** including a plurality of said hot tubes and a plurality of said cool tubes extending in parallel and side-by-side relationship with one another.

12. An assembly as set forth in claim **11** including a hot inlet in said first tank leading into said cylindrical hot chamber for receiving refrigerant from said gas cooler, a suction outlet in said first tank leading from said box-shaped cool chamber for discharging refrigerant from said box-shaped cool chamber to said compressor, a suction inlet in said second tank leading into said box-shaped cool chamber for receiving refrigerant from said evaporator, and a hot outlet in said second tank leading from said cylindrical hot chamber for discharging refrigerant from said cylindrical hot chamber to said expansion device.

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